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(73) Patentee:	LG Electronics LG Twin Towers, 20 Yeouido-dong, Yeongdeungpo-gu, Seoul, Korea		
(72) Inventor:	Lee, Young 56-38, Bongcheon 10-dong, Gwanak-gu, Seoul, Korea		
(74) Agent:	Park, Jang-Won		
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(54) Title of Invention: Method of Booting Personal Digital Assistant

Abstract

The present invention relates to a method of booting a personal digital assistant, wherein booting is performed by adding only a low-capacity memory for storing a boot loader to a main board within the personal digital assistant and by storing an operating system in an external memory means. The present invention can be achieved, in a personal digital assistant on which an external memory means can be mounted, by comprising a first step of activating a boot loader when power is applied to the personal digital assistant, and detecting whether a memory means is mounted outside the personal digital assistant; a second step of, if the external memory means is mounted, determining whether an operating system is stored in said memory means; a third step of, if the operating system is stored in said memory means, copying the operating system to an internal memory area of the personal digital assistant; and a fourth step of jumping to the RAM area with the operating system copied thereto when the copying of said operating system is completed, and executing the operating system.

Representative Drawings

Fig. 2

Specification

Brief Description of Drawings

Fig. 1 is an exemplary view illustrating the configuration of a general personal digital assistant.

Fig. 2 is a flowchart illustrating a process of booting a personal digital assistant according to the present invention.

Fig. 3 is an exemplary view illustrating an operating system condensation file for

use in copying an operating system when a personal digital assistant is booted in accordance with the present invention.

<Reference Numerals for Drawings>

30: External flash memory
S101: Power on
S102: Initiate boot loader in boot flash memory
S103: Is external flash memory mounted to expansion slot?
S104: Does operating system exist in external flash memory?
S105: Display error message on screen and terminate boot loader
S106: Copy operating system stored in external flash memory to RAM area
S107: Jump to RAM area in which operation system is copied
S108: Execute operating system

Detailed Description of the Invention

Object of the Invention

Technical Field Pertinent to the Invention and Prior Art

The present invention relates to a method of booting a personal digital assistant, and more particularly, to a method of booting a personal digital assistant, wherein booting is performed by adding only a low-capacity memory for storing a boot loader to a main board within the personal digital assistant and by storing an operating system in an external memory means.

In summary, a boot loader refers to a program that is executed first when a computer is powered on. In case of a general personal computer (PC), the first step of a booting operation is to fetch information from sector 0 on track 0 of side 0 of a booting device (hard disk).

This position contains information for use in performing booting and is called a boot sector.

In most systems using a hard disk as a booting device such as a disk operating system (DOS) or an NT system, information (an interrupt table and the like) for use in booting the system itself is copied to a boot sector and then used.

However, in a small computer system such as a personal digital assistant (PDA), it is difficult to include a high-capacity hard disk, and thus, a program for system booting, an operating system (OS), an application program and the like are stored in internal memories (RAM, ROM) (10, 20) as shown in Fig. 1.

A flash memory that can store data at any time and retain data even when power is not supplied is used for the ROM (20).

In general, a flash memory that is used for storing an operating system (OS), BIOS and the like within a terminal is a NOR type flash memory, which has the advantage that a program can be executed directly on the flash memory since read access can be made on a byte basis. However, the NOR type flash memory has high current consumption and is

expensive, and thus, a flash memory with a relatively lower capacity (1-32 MB) is mounted.

On the other hand, an external flash memory mounted via an external expansion slot of a terminal is a NAND type flash memory that is used for storing user data.

The NAND type flash memory performs both read access and write access on a block basis and has the advantage of low current consumption. However, since access is made only on a block basis, a program cannot be executed directly thereon. Thus, the entire program needs to be copied to and then executed on a RAM.

A modern personal digital assistant requires a high-capacity NOR type flash memory due to an increase in the size of operating systems, which results from gradually increasing uses thereof and switchover of user interfaces to graphic types. As a result, the unit cost of production of a terminal is high.

Further, when an operating system is used while being stored in an internal flash memory as described above, the system may be disabled upon occurrence of an error when the operating system is upgraded or replaced. If the system is disabled due to the occurrence of damage to the operating system, it is not easy to recover the system.

Technical Problems to be solved by the Invention

The present invention is conceived to solve the aforementioned problems in the prior art. It is an object of the present invention to provide a method of booting a personal digital assistant, wherein booting is performed by adding only a low-capacity memory for storing a boot loader to a main board within the personal digital assistant and by storing an operating system in an external memory means, thereby lowering the unit cost of production and facilitating upgrade and replacement.

To achieve the object, the present invention is characterized, in a personal digital assistant on which an external memory means can be mounted, by comprising a first step of activating a boot loader when power is applied to the personal digital assistant, and detecting whether a memory means is mounted outside the personal digital assistant; a second step of, if the external memory means is mounted, determining whether an operating system is stored in said memory means; a third step of, if the operating system is stored in said memory means, copying the operating system to an internal memory area of the personal digital assistant; and a fourth step of jumping to the RAM area in which the operating system is copied when the copying of said operating system is completed, and executing the operating system.

Constitution and Operation of the Invention

The present invention is characterized in that an operating system is stored in an external memory means mounted via an expansion slot of a terminal, and the operating system stored in the external memory means is loaded and used upon booting, thereby facilitating upgrade of the operating system and recovery of the terminal from an error caused by the operation system.

In the present invention, a flash memory for storing only a boot loader will be

referred to as a "boot flash memory" to distinguish it from a conventional flash memory used for storing an operating system and the like.

The boot loader stored in the boot flash memory performs a booting operation by reading an operating system from an external flash memory mounted to an expansion slot and copying the operating system to a RAM area.

Accordingly, a RAM having a higher capacity sufficient for storing an operating system than that of a conventional RAM should be used. However, it will be apparent that the use of a RAM having a higher capacity is less expensive compared to an increase in the capacity of a flash memory.

Since a RAM provides a higher read speed than a flash memory, the use of the RAM ensures a faster execution speed for an operating system than the use of an internal flash memory in the prior art.

The present invention is characterized in that various kinds of application programs and an operating system are stored in an external flash memory mounted to an expansion slot so that the operating system can be easily upgraded or replaced, and in that it is not necessary to mount a high-capacity flash memory for storing the operating system on a main board of a terminal, thereby reducing the size of the main board.

Fig. 2 is a flowchart illustrating a process of booting a personal digital assistant according to the present invention, wherein an operating system is stored in a high-capacity flash memory mounted outside the personal digital assistant, and a boot loader is stored in a low-capacity flash memory (boot flash memory) on a main board.

For your reference, the flash memory mounted outside via an expansion slot may be a smart media, a compact flash, an SD card, an MMC card or the like, and is not necessarily a NAND type flash memory.

When the personal digital assistant is powered on (cold boot) (S101), the boot loader on the boot flash memory is activated (S102). Then, whether a flash memory is mounted to an expansion slot of the personal digital assistant is checked (S103). If a flash memory is not mounted, an indication that there is no operating system is displayed on a screen of the personal digital assistant, and booting is stopped (S105).

If a flash memory is mounted but has no operating system stored therein (S104), an indication that there is no operating system is displayed on the screen, and booting is stopped (S105).

If a flash memory is mounted to the expansion slot and has an operating system stored therein (S103, S104), the boot loader copies the operating system stored in the flash memory to a RAM area (S106).

Operating system files are copied to specified addresses by referring to an operating system condensation file in which a flash memory copying method is written, as shown in Fig. 3. When the files are completely copied, the boot loader jumps to an address specified by the operating system condensation file and executes the operating system (S108).

Fig. 3 shows an example of the operating system condensation file, which specifies the names of the operating system files, addresses to be copied, the sizes of the files and an address to be jumped to after the copying is completed.

The boot loader is operated to perform the copy process when a cold boot is

performed. The cold boot corresponds to the first supply of power to the personal digital assistant, or a hard reset for forcibly rebooting the personal digital assistant.

Therefore, when the operating system is initially copied from the external flash memory to the internal RAM area, time to read the operating system from the flash memory and time to write the operating system to the RAM area are further consumed. However, there is no great difference in booting time between the case where the operating system is stored in the external flash memory and the conventional case where the operating system is stored in an internal flash memory since a cold boot does not frequently occur contrary to a warm boot (soft reset).

A difference between a conventional boot loader and the boot loader of the present invention will now be described. In case of the conventional boot loader, if booting including a cold boot is initiated, the boot loader directly jumps to the operating system area and executes the operating system. The boot loader is operated only when the operating system is upgraded and thus mainly performs an upgrade function.

However, the boot loader of the present invention is operated only when a cold boot is performed and thus mainly performs an action for causing the operating system in the external memory to reside in the internal RAM area. The boot loader of the present invention is characterized in that it does not require an additional function of upgrading the operating system.

For your reference, a method of upgrading or replacing an operating system in the case where the operating system is stored in the external flash memory as described above will be described by way of example.

If the flash memory is a card type, a card reader for interfacing the card with a computer may be used, or information input/output ports added to a personal digital assistant may be connected directly to the computer.

When the flash memory is interfaced with the computer in such a manner, a new operating system file for use in upgrading or replacing an existing operating system file is written on the flash memory. That is, the file is transferred to and stored in the flash memory by a data-transferring program of the computer.

Effects of the Invention

As described above, the method of booting a personal digital assistant according to the present invention has the advantage that upgrade and replacement of the operating system can be easily performed since an operating system is stored in an external flash memory mounted to an expansion slot.

Further, since only a boot loader is required to be stored in a flash memory mounted on a main board, the present invention has the advantage that it is possible to mount a flash memory with a low capacity and to reduce the size of the main board, thereby lowering the unit cost of production.

In addition, if system data are stored together in an external flash memory with an operating system stored therein, the present invention has the advantage that the original operating system and system data can be used as they are even when the flash memory is mounted to another terminal, thereby providing convenience to a user.

WHAT IS CLAIMED IS:

1. A method of booting a personal digital assistant on which an external memory means can be mounted, the method characterized by comprising:

a first step of activating a boot loader when power is applied to the personal digital assistant, and detecting whether a memory means is mounted outside the personal digital assistant;

a second step of, if the external memory means is mounted, determining whether an operating system is stored in said memory means;

a third step of, if the operating system is stored in said memory means, copying the operating system to an internal memory area of the personal digital assistant; and

a fourth step of jumping to the RAM area in which the operating system is copied when the copying of said operating system is completed, and executing the operating system.

2. The method as recited in claim 1, characterized in that the method further comprises:

if the external memory means is not mounted in said first step or the operating system is not stored in the second step, a process of displaying an indication that there is no operating system on a display means of the personal digital assistant and stopping booting.

3. The method as recited in claim 1, characterized in that the operation for copying operating system files by said boot loader is performed when power is first applied to the personal digital assistant or when cold boot is performed due to forcible hard reset by a user.

4. The method as recited in claim 1 or 3, characterized in that said boot loader performs the copying to specified addresses of the internal memory by referring to an operating system condensation file with a copying method written therein, and said boot loader jumps to an address specified by the operating system condensation file when the copying is completed and executes the operating system.

5. The method as recited in claim 4, characterized in that said operating system condensation file includes information on the names of the operating system files to be copied from the external memory to the internal memory, addresses to be copied, the sizes of the files and an address to be jumped to after the copying is completed.

6. The method as recited in claim 5, characterized in that said internal memory is a RAM and the external memory is a flash memory.